WHAT IS CLAIMED IS:

1. A computer software system for modeling a process capability on a computer, the computer software system comprising:

an operation model type for defining a plurality of operation models, each operation model representing an activity that can be performed by a process;

a resource model type for defining a plurality of resource models, each resource model representing capacity available for use in performing an activity and rules for allocating capacity to the activity; and

a buffer model type for defining a plurality of buffer models, each buffer model representing rules for controlling a flow of material between activities;

wherein the operation model type, buffer model type, and resource model type each comprise a plurality of fields defining attributes, the plurality of fields including a plurality of extension selector fields that allow a user to specify one of a plurality of optional extensions incorporating additional fields and semantics in addition to fields specified by the model type into each model selecting the optional extension; and

wherein defined operation models, buffer models, and resource models are stored as nodes in an interrelated process network model, the process network model formed by a plurality of operation models each specifying buffer models from which material is consumed and buffer models to which material is supplied and specifying resource models having capacity used in performing the activity specified by the operation model, such that both material and capacity usage are simultaneously represented along with timing constraints between activities.

2. The computer software system of Claim 1, further comprising:

an operation-plan model type for defining a plurality of operation-plan models, each operation-plan model representing a planned activity to be performed during a particular period in order to achieve a particular purpose;

a resource-plan model type for defining a plurality of resource-plan models, each resource-plan model representing an amount of available capacity and planned usage of the available capacity by operation-plan models; and

a buffer-plan model type for defining a plurality of buffer-plan models, each buffer-plan model representing planned flow of material that controlled by the buffer-plan model as a result of planned operation-plan models;

wherein the operation-plan model types, buffer-plan model types, and resource-plan model types each comprise a plurality of fields that define attributes, including a plurality of extension selector fields corresponding to operation, buffer, and resource model type fields and specifying corresponding extension of a plurality of optional extensions which incorporate additional fields and semantics into each model selecting the optional extension in addition to those specified by the model type; and

wherein the defined operation models, buffer models, and resource models are stored as nodes in an interrelated process-plan network model, the process-plan network model formed by operation-plan models specifying buffer-plan models from which material is consumed and buffer-plan models to which material is supplied and specifying resource-plan models having capacity planned to be used in order to perform the activity specified by

the operation-plan model, such that both material and capacity usage are simultaneously represented and addressed along with operation timing constraints in creating and managing a plan for the process.

3. The computer software system of Claim 1, wherein the operation model type has associated with one of the extension selectors a plurality of extensions that define behavior as a sequence of other operations, with varying rules on how the sequence may be ordered or may spread out in time.

4. The computer software system of Claim 2, wherein:

the operation model type has associated with one of the extension selectors a plurality of extensions that define behavior as a sequence of other operations, with varying rules on how the sequence may be ordered or may spread out in time; and

the operation-plan model type has a plurality of extensions each corresponding to each of the extensions of the operation model type, which represent extension-specific choices for a particular plan for the process.

5. The computer software system of Claim 1, wherein the operation model type has associated with one of the extension selectors a plurality of extensions that define behavior as one of several other operation models, with varying rules on how a single one of those operation models is chosen to be performed.

6. The computer software system of Claim 2, wherein:

the operation model type has associated with one of the extension selectors a plurality of extensions that define behavior as one of several other operation models, with varying rules on how a single one of those operation models is chosen to be performed; and

the operation-plan model type has a plurality of extensions each corresponding to each of the extensions of the operation model type, which represent extension-specific choices for a particular plan for the process.

7. The computer software system of Claim 1, wherein the operation model type has associated with one of the extension selectors a plurality of extensions that define behavior as a set of other operations each having individual precedence constraints, with varying rules on how the set of operations is planned.

8. The computer software system of Claim 2, wherein:

the operation model type has associated with one of the extension selectors a plurality of extensions that define behavior as a set of other operations each having individual precedence constraints, with varying rules on how the set of operations is planned; and

the operation-plan model type has a plurality of extensions each corresponding to each of the extensions of the operation model type, which represent extension-specific choices for a particular plan for the process.

9. The computer software system of Claim 1, wherein the operation model type includes a plurality of extensions that define behavior as a sequence of other operations, as one of several other operation models, and as a set of other operations each having individual

precedence constraints, such that a complex hierarchy of operation models can be formed in order to represent complex processes with alternatives, sequences, and precedence constraints.

10. The computer software system of Claim 2, wherein:

the operation model type includes a plurality of extensions that define behavior as a sequence of other operations, as one of several other operation models, and as a set of other operations each having individual precedence constraints, such that a complex hierarchy of operation models can be formed in order to represent complex processes with alternatives, sequences, and precedence constraints;

the operation-plan model type has a plurality of extensions each corresponding to each of the extensions of the operation model type, which represent extension-specific choices for a particular plan for the process; and

a plan for such a complex process can be represented with all decisions to be made in order to define a particular plan.

11. The computer software system of Claim 1, wherein the resource model type has associated with one of the extension selectors a plurality of extensions defining fields and semantics that each describe how an efficiency of the resource model changes over time.

12. The computer software system of Claim 2, wherein:

the resource model type has associated with one of the extension selectors a plurality of extensions

defining fields and semantic that each describe how an efficiency of the resource model changes over time; and

the resource-plan model type has a plurality of extensions each corresponding to each of the extensions of the resource model type, which represent extension-specific choices for a particular plan for the process.

13. The computer software system of Claim 1, wherein the resource model type has associated with one of the extension selectors a plurality of extensions defining fields and semantics that each describe a maximum size of operation models that simultaneously use a resource model.

14. The computer software system of Claim 2, wherein:

the resource model type has associated with one of the extension selectors a plurality of extensions defining fields and semantics that each describe a maximum size of operation models that simultaneously use a resource model; and

the resource-plan model type has a plurality of extensions corresponding to each of the extensions of the resource model type, which represent extension-specific choices for a particular plan for the process.

15. The computer software system of Claim 1, wherein the resource model type has associated with one of the extension selectors a plurality of extensions that define fields and semantics that each describe when maintenance operations should be planned.

16. The computer software system of Claim 2, wherein:

the resource model type has associated with one of the extension selectors a plurality of extensions that define fields and semantics that each describe when maintenance operations should be planned; and

the resource-plan model type has a plurality of extensions corresponding to each of the extensions of the resource model type, which represent extension-specific choices for a particular plan for the process.

17. The computer software system of Claim 1, wherein the resource model type has associated with one of the extension selectors a plurality of extensions defining fields and semantics that each describe how operation plans should be padded to compensate for variability of a resource model.

18. The computer software system of Claim 2, wherein:

the resource model type has associated with one of the extension selectors a plurality of extensions defining fields and semantics that each describe how operation plans should be padded to compensate for variability of a resource model; and

the resource-plan model type has a plurality of extensions corresponding to each of the extensions of the resource model type, which represent extension-specific choices for a particular plan for the process.

19. The computer software system of Claim 1, wherein:

the resource model type has associated with one of the extension selectors a plurality of extensions defining fields and semantics that each describe how an efficiency of the resource model changes over time,

describe a maximum size of operation models that simultaneously use a resource model, describe when maintenance operations should be planned, and describe how operation plans should be padded to compensate for variability of a resource model;

such that a wide variety of resource models can be represented in one network without greatly increasing complexity of each resource model requiring only a small subset of the overall software system modeling capabilities.

20. The computer software system of Claim 2, wherein:

the resource model type has associated with one of the extension selectors a plurality of extensions defining fields and semantics that each describe how an efficiency of the resource model changes over time, describe a maximum size of operation models that simultaneously use a resource model, describe when maintenance operations should be planned, and describe how operation plans should be padded to compensate for variability of a resource model; and

the resource-plan model type has a plurality of extensions each corresponding to each of the extensions of the resource model type, which represent extension-specific choices for a particular plan for the process;

such that a wide variety of resource models and a plan for each of the resource models containing all decisions regarding capacity can be represented in one network without greatly increasing complexity of each resource model requiring only a small subset of the overall software system modeling capabilities.

21. The computer software system of Claim 1, wherein the buffer model type has an operation that defines how material managed by a buffer is stored, and the specified operation model can be extended to specify different scrap factors.

22. The computer software system of Claim 2, wherein the buffer model type has an operation that defines how material managed by a buffer is stored, and the buffer-plan models create operation-plan models to store the material managed by the buffer.

23. The computer software system of Claim 1, wherein the buffer model type has an operation that defines how material is received into a buffer and how the material is picked from the buffer.

24. The computer software system of Claim 2, wherein:

the buffer model type has an operation that defines how material is received into a buffer and how material is picked from the buffer; and

the buffer-plan models create operation-plan models to receive each lot of material and pick each lot consumed.

25. The computer software system of Claim 1, wherein:

the buffer model type has an operation that defines how material managed by a buffer is stored, and the specified operation model can be extended to specify different scrap factors and has an operation that defines how material is received into a buffer and how the material is picked from the buffer;

such that a wide variety of resource models can be represented in one network without greatly increasing complexity of each resource model requiring only a small subset of the overall software system modeling capabilities; and

such that a complex hierarchy of operation models can be formed to represent complex processes with many alternatives, sequences, precedence constraints.

26. The software system of Claim 2, wherein:

the buffer model type has an operation that defines how material managed by a buffer is stored, and the specified operation model can be extended to specify different scrap factors and has an operation that defines how material is received into a buffer and how the material is picked from the buffer; and

the buffer-plan models create operation-plan models to receive each lot of material and pick each lot consumed and to store the material that is managed by the buffer at all times;

such that a wide variety of resource models and a plan for each of those resource models containing all decisions regarding capacity can be represented in one network without greatly increasing complexity of each resource model requiring only a small subset of the overall software system modeling capabilities; and

such that a complex hierarchy of operation models can be formed to represent complex processes with many alternatives, sequences, precedence constraints, and a plan for such a complex process can be represented with all the decisions to be made in order to define a particular plan.

27. The computer software system of Claim 25, used to model a manufacturing process wherein: operation models are used to represent traditional manufacturing operations, routings, bills-of-material, and storage; resource models are used to represent machines, tools, fixtures, and labor; and buffer models are used to represent SKUS, bins, buffers, or inventories.

28. The computer software system of Claim 26, used to model and plan a manufacturing process wherein:

operation models are used to represent traditional manufacturing operations, routings, bills-of-material, and storage; resource models are used to represent machines, tools, fixtures, and labor; and buffer models are used to represent SKUS, bins, buffers, or inventories; and

operation-plans, resource-plans and buffer-plans are used to represent corresponding plans for those entities.

29. The computer software system of Claim 25, used to model a distribution network wherein: operation models are used to represent transport, loading, unloading, storage, receiving, picking, palletizing, and packaging activities and traditional bills-of-distribution; resource models represent docks, trucks, pallets, forklifts, labor, and storage facilities; buffer models represent SKUS, bins, and inventories.

30. The computer software system of Claim 26, used to model a distribution network wherein:

operation models are used to represent transport, loading, unloading, storage, receiving, picking, palletizing, and packaging activities and traditional bills-of-distribution; resource models represent docks,

trucks, pallets, forklifts, labor, and storage facilities; and buffer models represent SKUS, bins, and inventories; and

operation-plans, resource-plans, and buffer-plans are used to represent corresponding plans for those entities.

31. The computer software system of Claim 25, used to model a manufacturing process wherein:

operation models are used to represent traditional manufacturing operations, routings, bills-of-material, and storage; resource models are used to represent machines, tools, fixtures, and labor; and buffer models are used to represent SKUS, bins, buffers, or inventories; and

operation models are used to represent transport, loading, unloading, storage, receiving, picking, palletizing, and packaging activities and traditional bills-of-distribution; resource models represent docks, trucks, pallets, forklifts, labor, and storage facilities; buffer models represent SKUS, bins, and inventories;

such that a full supply chain can be modeled.

32. The computer software system of Claim 26, used to model and plan a manufacturing process wherein:

operation models are used to represent traditional manufacturing operations, routings, bills-of-material, and storage; resource models are used to represent machines, tools, fixtures, and labor; and buffer models are used to represent SKUS, bins, buffers, or inventories;

operation models are used to represent transport, loading, unloading, storage, receiving, picking,

palletizing, and packaging activities and traditional bills-of-distribution; resource models represent docks, trucks, pallets, forklifts, labor, and storage facilities; and buffer models represent SKUS, bins, and inventories; and

operation-plans, resource-plans and buffer-plans are used to represent corresponding plans for those entities;

such that a full supply chain can be modeled and planned.

33. The computer software system of Claim 25 used to model project plans wherein: operation models are used to represent requirements gathering, design, testing, prototyping, tooling, and production; resource models are used to represent the labor, machines, tools, and testers; and buffer models represent various milestones to be achieved in order to move from one activity to another.

34. The computer software system of Claim 26 used to model project plans wherein:

operation models are used to represent requirements gathering, design, testing, prototyping, tooling, and production; resource models are used to represent the labor, machines, tools, and testers; and buffer models represent various milestones to be achieved in order to move from one activity to another; and

operation-plans, resource-plans, and buffer-plans are used to represent corresponding plans for those entities.

35. The computer software system of Claim 25, used to model a manufacturing process wherein:

operation models are used to represent transport, loading, unloading, storage, receiving, picking, palletizing, and packaging activities and traditional bills-of-distribution; resource models represent docks, trucks, pallets, forklifts, labor, and storage facilities; and buffer models represent SKUS, bins, and inventories; and

operation models are used to represent requirements gathering, design, testing, prototyping, tooling, and production; resource models are used to represent the labor, machines, tools, and testers; and buffer models represent various milestones to be achieved in order to move from one activity to another; and

operation-plans, resource-plans, and buffer-plans are used to represent corresponding plans for those entities;

such that a full supply chain can be modeled and planned and such that a supply chain and design activities involved in introducing new products and phasing out old products together with on-going production and delivery of existing products can be represented and planned.

37. The computer software system of Claim 1, wherein each operation model may specify another operation, each resource model may specify another resource, and each buffer model may specify another buffer as its family and may specify a number of fields as inherited from that family, thereby allowing the fields to be changed in the family by a user, and result in changes to all models that inherit that field.

38. The computer software system of Claim 37, wherein each operation model, resource model, and buffer

operation models are used to represent traditional manufacturing operations, routings, bills-of-material, and storage; resource models are used to represent machines, tools, fixtures, and labor; and buffer models are used to represent SKUS, bins, buffers, or inventories;

operation models are used to represent transport, loading, unloading, storage, receiving, picking, palletizing, and packaging activities and traditional bills-of-distribution; resource models represent docks, trucks, pallets, forklifts, labor, and storage facilities; buffer models represent SKUS, bins, and inventories; and

operation models are used to represent requirements gathering, design, testing, prototyping, tooling, and production; resource models are used to represent the labor, machines, tools, and testers; and buffer models represent various milestones to be achieved in order to move from one activity to another;

such that a full supply chain can be modeled and a supply chain and design activities involved in introducing new products and phasing out old products together with on-going production and delivery of existing products can be represented.

36. The computer software system of Claim 26, used to model and plan a manufacturing process wherein:

operation models are used to represent traditional manufacturing operations, routings, bills-of-material, and storage; resource models are used to represent machines, tools, fixtures, and labor; and buffer models are used to represent SKUS, bins, buffers, or inventories;

model that specifies a family can also specify a range of dates during which the model is effective such that outside of the range the model is modeled as if the model does not exist.

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39. A computer system for executing a computer software system for modeling a process capability, the computer system comprising:

a data storage device operable to store data relating to a model of process capability;

an execution memory operable to store data representing a computer software system; and

a processor coupled to the data storage device and to the execution memory, the processor operable to execute the computer software system, wherein the computer software system comprises;

an operation model type for defining a plurality of operation models, each operation model representing an activity that can be performed by a process;

a resource model type for defining a plurality of resource models, each resource model representing capacity available for use in performing an activity and rules for allocating capacity to the activity; and

a buffer model type for defining a plurality of buffer models, each buffer model representing rules for controlling a flow of material between activities;

wherein the operation model type, buffer model type, and resource model type each comprise a plurality of fields defining attributes, the plurality of fields including a plurality of extension selector fields that allow a user to specify one of a plurality of optional extensions incorporating additional fields and semantics in addition to fields specified by the model type into each model selecting the optional extension; and

wherein defined operation models, buffer models, and resource models are stored as nodes in an interrelated process network model, the process network model formed by a plurality of operation models each

specifying buffer models from which material is consumed and buffer models to which material is supplied and specifying resource models having capacity used in performing the activity specified by the operation model, such that both material and capacity usage are simultaneously represented along with timing constraints between activities.

40. The computer system of Claim 39, wherein the computer software system further comprises:

an operation-plan model type for defining a plurality of operation-plan models, each operation-plan model representing a planned activity to be performed during a particular period in order to achieve a particular purpose;

a resource-plan model type for defining a plurality of resource-plan models, each resource-plan model representing an amount of available capacity and planned usage of the available capacity by operation-plan models; and

a buffer-plan model type for defining a plurality of buffer-plan models, each buffer-plan model representing planned flow of material that controlled by the buffer-plan model as a result of planned operation-plan models;

wherein the operation-plan model types, buffer-plan model types, and resource-plan model types each comprise a plurality of fields that define attributes, including a plurality of extension selector fields corresponding to operation, buffer, and resource model type fields and specifying corresponding extension of a plurality of optional extensions which incorporate additional fields and semantics into each model selecting the optional extension in addition to those specified by the model type; and

wherein the defined operation models, buffer models, and resource models are stored as nodes in an interrelated process-plan network model, the process-plan network model formed by operation-plan models specifying buffer-plan models from which material is consumed and buffer-plan models to which material is supplied and specifying resource-plan models having capacity planned to be used in order to perform the activity specified by the operation-plan model, such that both material and capacity usage are simultaneously represented and addressed along with operation timing constraints in creating and managing a plan for the process.

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